

WEEK 6: MAY 21 - 28 (8 days including Memorial Day)

1. Water Budget Implementation

The status of juvenile fish migration in the lower Columbia River, coupled with a sharp drop in flow contribution from the Snake River, prompted the FPC on May 17 to request Water Budget flow augmentation for an average of 220 kcfs for this week at The Dalles Dam. To meet this average flow level might have required flow greater than 140 kcfs at Priest Rapids Dam on some days, which would have been accounted for as Water Budget usage. The COE response, however, was to provide only a weekly average flow of 140 kcfs at Priest Rapids, even though that might not provide the requested flow level at The Dalles Dam. On May 21, the FPC reiterated the lower river flow request for 220 kcfs weekly average at The Dalles Dam. This did not change the earlier stated COE position. On May 22, the FPC requested cessation of the John Day reservoir storage operations that were taking place, as those operations further reduced lower river flows at a time when increased flows were urgently needed. The COE concurred in this case, and took action accordingly.

In addition to the request made the previous week for supplemental flows from Dworshak and Brownlee reservoirs, the FPC this week requested that nighttime flows at Lower Granite Dam be increased to 80 kcfs during the hours of 2000 to 0200 from May 24 through 28 to help move juvenile fish through the reservoir. The COE/BPA decision on that request was to pass inflow or greater from 2000 to 2400 hours during the five nights requested. About mid-week, the COE also decided to increase Dworshak outflow to full hydraulic capacity of 10 kcfs, because current rain-induced runoff increases would allow the FPC's request for supplemental flow to be met without jeopardizing refill. The increased Dworshak Dam outflow would help maintain flood control space. The combination of nighttime flow shaping starting May 24, and the Dworshak Dam outflow increase to hydraulic capacity starting May 25, were termed "special operations", although the Dworshak reservoir contribution was part of the non-shapeable Water Budget commitment.

2. Supporting Rationale

a. Streamflow and Water Supply

The reservoir system continued to refill, except for Grand Coulee reservoir, which was providing mid-Columbia Water Budget flow augmentation releases. As of May 23, Dworshak reservoir had recovered about 10 feet since the May 15 end of Water Budget releases and was 18 feet from full; Brownlee reservoir had recovered about 2 feet and was 9 feet from full. Grand Coulee was at elevation 1256, which was below its flood control rule curve and 34 feet from full. Streamflows during the previous week averaged about 153 kcfs at Priest Rapids Dam, 55 kcfs at Lower Granite Dam (including the last 2 days with Water Budget flow augmentation), and 206 kcfs at The Dalles Dam.

On May 17, the COE provided an average flow projection of 110 kcfs for this week at Priest Rapids Dam. After power marketing plans incorporated Water Budget flow augmentation, the May 21 SSARR projection was for a weekly average of 140 kcfs at Priest Rapids Dam. Snake River projections were for the weekly average to be only 47 kcfs which, when added to mid-Columbia flows, would result in a lower Columbia average for the week of less than 200 kcfs. Hence the FPC requested 220 kcfs average flow at The Dalles Dam.

b. Smolt Monitoring

Approximately 3.4 million hatchery spring migrants were released above Bonneville Dam during the previous week, completing the planned releases for 1990's spring outmigration. Hatchery releases of 8.2 million summer migrants began during the previous week, which was 35% of the planned 23.2 million fish for the 1990 summer outmigration period. Juvenile fish transportation totaled 9.5 million fish from the three collection projects, about equally divided between yearling chinook and steelhead.

Snake River index counts at Lower Granite Dam continued their steady decrease with the decreasing flows, reaching a low of 29,000 fish on May 24, the day the special flow operations described above were instituted. Smolt index counts responded to these flow improvements with a jump to nearly 430,000 fish three days later on May 27. The total index count for the five days preceding these operations was only about 250,000 fish, compared to about 1,300,000 fish for the five days following their start. These improved passage conditions were occurring later than desired. The physiological monitoring of steelhead from the run-at-large at Lower Granite Dam showed ATPase values leveling off for both wild and hatchery stocks since May 17. If further migration delays were experienced; these steelhead in time would begin to revert back to parr, thus reducing survival upon saltwater entry. This is another reason for FPC requesting higher lower river flow levels.

Mid-Columbia index counts for steelhead were projected on May 25 to be only about 40% of the total annual index anticipated for 1990 at Rock Island Dam, and between 50 and 75% of what was

anticipated at McNary Dam. These projections were based on the number of hatchery steelhead released above each site and the historic ratio of annual passage index to hatchery release.

Lower Columbia collections at Bonneville Dam were dominated early in the previous week by the final release of Spring Creek Hatchery tule fall chinook for the season, and by coho at the end of that week.

c. Water Quality

Water temperatures remained near normal for this time of year (about 55°F) and dissolved gas was about 115% saturation in the mid-Columbia and below 110% saturation elsewhere in the system.

d. Other Considerations

Hatchery releases of subyearling salmon were scheduled throughout late spring and early summer. June releases were scheduled for hatcheries in the lower Snake, lower Columbia, and Hanford section of the mid-Columbia rivers.

The weather trend for this week and into the next week was for temperatures below normal and precipitation above normal, which were predicted to help keep Snake River passage conditions from further deterioration.

WEEK 7: MAY 29 - JUNE 3 (six days following Memorial Day)

1. Water Budget Implementation

The Water Budget flow augmentation decision for this week, made by the FPC on May 24, was to continue the attempt to maintain higher flows in the lower Columbia by requesting a weekly average of 220 kcfs at The Dalles Dam. The COE again planned to treat that as a request for 140 kcfs weekly average flow at Priest Rapids Dam. Dworshak reservoir continued to operate at hydraulic capacity because of increasing runoff, and began to spill water at the end of this week (June 4) in order to retain about 5 feet of flood control space. This provided the needed flow increases in the lower Snake River, and prompted a May 29 request from the FPC to continue special operations at Dworshak and Lower Granite reservoirs through June 4.

2. Supporting Rationale

a. Streamflow and Water Supply

Runoff responses to relatively heavy late May precipitation increased inflow into storage reservoirs and accelerated refill, bringing flood control rule curves into consideration. Mid-week (June 1) plans were to regulate Arrow reservoir outflow in order to maintain flood control space in Grand Coulee reservoir. To prevent Dworshak reservoir from filling too fast, the project outflow would continue at full hydraulic capacity or greater until reservoir inflow decreased below hydraulic capacity, which was estimated to occur about June 10. Then outflow would be reduced to fill the

reservoir. Brownlee Dam would release 7 to 12 kcfs until the reservoir was full, estimated to occur on June 2, and then pass inflow, which would be about 20 kcfs at that time. Streamflows during the previous week averaged about 141 kcfs at Priest Rapids Dam, 58 kcfs at Lower Granite Dam, including the higher releases from Dworshak Dam, and 201 kcfs at The Dalles Dam. An average flow of 220 kcfs had been requested for The Dalles Dam (Table 4). By the end of the previous week, 1.9 MAF of the 3.45 MAF total Columbia River Water Budget allocation had been used. Using 140 kcfs at Priest Rapids Dam for Water Budget accounting, Water Budget use would total 2.66 MAF at the end of this week.

The COE projection on May 24 was for an average flow of 100 kcfs for this week at Priest Rapids Dam. In actuality, the increased runoff and resulting storage operations for flood control and power described above produced an average of 182 kcfs at Priest Rapids Dam for this week. These conditions produced better flow levels in the Snake and lower Columbia rivers this week, averaging 105 kcfs at Lower Granite Dam and 283 kcfs at The Dalles Dam. These were the highest flows of the spring migration season in the Snake and lower Columbia rivers.

b. Smolt Monitoring

As of May 24, hatchery releases of summer migrants totaled 10.6 million fish, 46% of the planned releases for the 1990 summer outmigration season. No new hatchery releases were made this week, although many of the previous week's releases were still underway. The juvenile fish transportation total as of May 25 was 10.8 million fish: 6.9 million from Lower Granite Dam, 1.5 million from Little Goose Dam, and 2.4 million from McNary Dam.

Snake River index counts at Lower Granite Dam continued to respond to improved flow levels, remaining above 200,000 fish daily through May 30 and peaking again at more than 285,000 fish on June 1 with flows above 100 kcfs. It appeared that higher flows during this week were succeeding in flushing many of the remaining spring migrants from the Snake River.

Mid-Columbia index counts exhibited a similar response to flows as high as 221 kcfs at Priest Rapids Dam on May 31, with consistent increases in the passage indices at Rock Island Dam. Indications were that many of the remaining spring migrants in the mid-Columbia River also had reached the lower Columbia River by the end of the week.

Lower Columbia passage indices for subyearling chinook also increased dramatically at McNary, The Dalles, and Bonneville dams in response to increased flows, which were well above 300 kcfs in the lower river for several days during this week. Index count increases for yearling chinook and steelhead at John Day and The Dalles dams reflected a barge release of about 600,000 fish (85% steelhead, 15% chinook) into John Day reservoir on May 30. This release was necessary because a control room fire caused the total shutdown of John Day Dam on May 29, and made the navigation

locks inoperable due to lack of power.

c. Water Quality

By the end of the previous week, water temperatures leveled off around 54°F in the mid-Columbia, 56°F in the Snake, and 58°F in the lower Columbia rivers, a few degrees below normal. Dissolved gas readings ranged from 105 to 110% saturation in the Snake and lower Columbia rivers above John Day Dam, and from 110 to 117% in the mid-Columbia River. The aforementioned outage at John Day Dam, which required all flow to be passed as spill, caused a jump in dissolved gas from 125 to 135% saturation at The Dalles Dam, and from 120 to 128% at Bonneville Dam. Monitoring of fish passing those two projects, while dissolved gas saturation was above 125%, showed a high percentage of smolts with gas bubble disease, especially steelhead. This undoubtedly had adverse impact on the migrants, but the magnitude of the mortalities was unknown (see Section III of this report).

d. Other Considerations

Increases in natural runoff and accompanying streamflows were anticipated because of the wet weather in late May. Precipitation totals for the month were 227% of average above Grand Coulee Dam, 141% above Ice Harbor Dam, and 182% above The Dalles Dam. Snow was occurring this week above 4,000 feet elevation in some areas. The freezing level was expected to reach 7,000 feet the following week, and precipitation was expected to remain normal. Under these conditions, continued relatively high runoff was anticipated the following week.

The large numbers of fish arriving at Lower Granite Dam in response to improved flow conditions were taxing the raceway holding capacity, making it imperative to keep the fish transport barges moving without interruption. Thus, the decision was made to release the barge load with juvenile fish below McNary Dam when the John Day navigation lock was inoperable and blocked barge traffic in either direction. This allowed the barge to return to Lower Granite Dam for additional loading from the raceways, rather than continuing downstream to release the fish nearer John Day Dam or wait until the lock was repaired.

WEEK 8: JUNE 4 - 10

1. Water Budget Implementation

With flows at The Dalles Dam were expected to average more than 240 kcfs this week. Therefore, the FPC did not request Water Budget flow augmentation on May 31 for this week, but did retain the option to do so later in the week if flows at The Dalles Dam were scheduled to go below 220 kcfs. At the start of this week, there was 0.79 MAF of unused mid-Columbia Water Budget remaining. Snake River flows were 114 kcfs at Lower Granite Dam on May 31. This flow

level provided good passage conditions so that additional flow augmentation requests were unnecessary.

2. Supporting Rationale

a. Streamflow and Water Supply

Grand Coulee reservoir was expected to be at its flood control rule curve elevation of 1270 (20 feet from full) by June 10; after that date it would pass inflow in order to retain flood control space. Dworshak Dam continued to release flows in excess of its hydraulic capacity in order to retain about five feet of flood control space in the reservoir. This operation was expected to continue as long as inflow (now about 15 kcfs) remained relatively high. Brownlee reservoir was now full and passing about 20 kcfs inflow. As stated earlier, streamflows during the previous week averaged 182 kcfs at Priest Rapids Dam, 105 kcfs at Lower Granite Dam, and 283 kcfs at The Dalles Dam. Even higher flows were expected for this week at Priest Rapids and The Dalles dams, although the COE provided a projection on May 31 for a weekly average of greater than 140 kcfs at Priest Rapids Dam without an indication of how much greater. In contrast, the May 30 SSARR streamflow projections indicated an average for this week of 175 kcfs at Priest Rapids Dam and 244 kcfs at The Dalles Dam.

b. Smolt Monitoring

Subyearling fall chinook releases of 9.2 million fish began this week at Priest Rapids and Lyons Ferry hatcheries. These releases were scheduled to be made over 12 to 36 days at each respective hatchery. These releases brought the total hatchery release for summer migrants to 19.8 million fish, 85% of the planned total for the season.

Snake River passage indices for spring migrants were decreasing during the previous week at all of the projects, indicating that high flows since May 30 probably had moved most of the spring migrants to transportation facilities or into the lower Columbia River.

Mid-Columbia passage indices for spring migrants were also decreasing during the previous week at Rock Island Dam, indicating that most of the mid-Columbia spring migrants had reached the lower river. This was reflected in a corresponding decrease in passage indices at McNary Dam. The higher flows since May 30 also increased the passage indices of subyearling fall chinook at both Rock Island and McNary dams.

Increases in the lower Columbia passage indices for subyearling chinook at The Dalles and Bonneville dams also reflected the increased flows. It was estimated that with the lower river flows ranging between 280 and 340 kcfs from May 30 to June 3, the fish released from barges below McNary Dam traveled at an average speed of 40 miles per day to Bonneville Dam.

c. Water Quality

Water temperatures remained in the range of 52-59°F, which kept them a little below normal for

this time of year. Resumed operation and reduced spill at John Day Dam reduced dissolved gas levels at Bonneville Dam to below 115% saturation by the end of this week, virtually eliminating gas bubble disease observations at the monitoring sites.

d. Other Considerations

June precipitation to day 5 was 307% of average above Grand Coulee Dam, 74% above Ice Harbor Dam, and 222% above The Dalles Dam. That, together with the outlook for continued wet weather for the next week, indicated that there might not be need for any additional Water Budget flow augmentation this year.

WEEK 9: JUNE 11 - 15 (last 5 days)

1. Water Budget Implementation

Continuing high flows in the lower river precluded any request for Water Budget flow augmentation on the June 7 decision date. The mid-Columbia Water Budget usage ended on June 3 with a total of 2.66 MAF used (Table 4). The 0.79 MAF unused would have been more than adequate to maintain the flow level requested at The Dalles Dam for the week of May 21 to 28, and would have reduced the high flow levels required from May 29 to June 15 to meet flood control requirements.

2. Supporting Rationale

a. Streamflow and Water Supply

Considerable runoff potential remained at the end of this week, as evidenced by a snow survey of the Dworshak watershed showing the snowline at elevation 5300 feet with 19% of the area still with snow cover. Portions of the Flathead watershed snow in the upper Columbia still held 200-300% of the normal water content for this time of year. As a result, Grand Coulee Dam was passing 215 kcfs inflow, Dworshak Dam was passing 12 kcfs, and Brownlee Dam, with a full reservoir, was passing 14 kcfs. Streamflows during the previous week averaged 234 kcfs at Priest Rapids Dam, 91 kcfs at Lower Granite Dam, and 333 kcfs at The Dalles Dam. The averages for this week at the same three locations were 248, 88, and 331 kcfs, respectively. The COE projection provided on June 7 was for an average of greater than 140 kcfs at Priest Rapids Dam for this week, while the June 6 SSARR projections indicated that the average would be 232 kcfs.

b. Smolt Monitoring

As of June 14, a total of 20.1 million summer migrants had been released into the system. An additional 3.2 million summer migrants released from late June through August 1990 were expected to complete the hatchery releases for the 1990 outmigration season. Monitoring data indicated that the spring migration was winding down throughout the basin, while the summer migration was well

underway by the end of this week.

Snake River steelhead were still being collected in sizeable numbers at Lower Granite Dam (15,000-22,000 per day) this week. Fall chinook released at Lyons Ferry Hatchery on May 6 began showing in large numbers at Lower Monumental Dam the evening of June 8.

The mid-Columbia passage index for subyearling chinook, dominated by Priest Rapids Hatchery fall chinook, exhibited a large increase on June 14 at McNary Dam. Large numbers of branded subyearling spring chinook from Leavenworth Hatchery were also recovered at McNary Dam from June 12 to 14.

Lower Columbia branded fall chinook from the Irrigon Hatchery May 23 release in the Umatilla River began arriving June 11 at John Day Dam and June 12 at Bonneville Dam.

Figure 3 illustrates passage index counts, actual daily average flows, and Water Budget flow request levels and days for the period April 1 through June 30 in the Snake, mid-Columbia, and lower Columbia rivers. These plots once again illustrate the close parallel between increases and decreases in index counts and flows. The instantaneous flow of 335 kcfs reached at Priest Rapids Dam on June 8 was the highest flow at that location since 1982. The highest flow for this year in the lower river was 371 kcfs at McNary Dam; it also occurred on June 8.

c. Water Quality

Water temperatures again remained fairly constant instead of the normal gradual increase, resulting in temperature ranges of 55 to 59°F, which were about 2 to 5°F below normal for this time of year. Dissolved gas levels this week ranged between 110 and 118% saturation, without any incidence of gas bubble disease in juvenile migrants detected after June 12.